# The Paretian Optimum

## Pareto-Optimal Composition of Outputs and Perfect Competition:

Like the other two marginal conditions, the third marginal condition of Pareto-efficient composition of output is also guaranteed by perfect competition, where the prices $p_1$ and $p_2$ of the goods $Q_1$ and $Q_2$, are given to the two firms and two consumers.

Also, in profit-maximising equilibrium under perfect competition, we have the marginal cost of production ($MC_1$) of $Q_1$ equal to pi and the marginal cost of production ($MC_2$) of $Q_2$ equal to $p_2$ (i.e., $p_1$ = MQ and P2 = $MC_2$).

Now production of 1 additional unit of $Q_1$ requires an extra $MC_1$ amount of money which might produce $\frac{MC_1}{MC_2}$ units of $Q_2$, since production of 1 unit of $Q_2$ requires $MC_2$ amount of money. From this it follows that $\frac{MC_1}{MC_2}$ units of $Q_2$ can be transformed into 1 unit of $Q_1$.

That is, we have

$$MRPT_{Q_2 \text{ into } Q_1} = \frac{MC_1}{MC_2} = \frac{p_1}{p_2} \left( = \begin{array}{l} \text{constant, since under perfect competition,} \\ \text{both } p_1 \text{ and } p_2 \text{ are constants} \end{array} \right) \quad (21.26)$$

Also, for each utility-maximising consumer, we have

$$MRS_{Q_1, Q_2} = \frac{p_1}{p_2}$$

Therefore, under perfect competition, we have

$$MRPT_{Q_2 \text{ into } Q_1} = \frac{MC_1}{MC_2} = \frac{p_1}{p_2} = MRS_{Q_1, Q_2} \text{ of consumer I} = MRS_{Q_1, Q_2} \text{ of consumer II} \quad (21.27)$$

$$\Rightarrow MRPT_{Q_2 \text{ into } Q_1} = MRS_{Q_1, Q_2} \text{ of consumer I} = MRS_{Q_1, Q_2} \text{ of consumer II} \quad (21.28)$$

We have seen above that the Pareto-efficient product-mix cannot be obtained unless the MRPT of $Q_2$ into $Q_1$ and the

MRS of $Q_1$ for $Q_2$ for each consumer are equal, and that this condition is guaranteed under perfect competition. We may now see graphically how eqn. (21.28) can be solved for the combination of the two goods that would make the production sector's plans consistent with the household sector's plans.

The economic interpretation of (21.27) is easy to understand. For, if $\frac{MC_1}{MC_2} > \frac{p_1}{p_2}$, then, on the margin, cost of $Q_1$ increases by a larger proportion than its revenue (prices being constant) in relation to those of $Q_2$. Therefore, it would be desirable for the society to produce less of $Q_1$ and more of $Q_2$ and, as it does this, $MC_1$ would fall and $MC_2$ would rise resulting in a fall in $\frac{MC_1}{MC_2}$, and this would go on till $\frac{MC_1}{MC_2}$ becomes equal to $\frac{p_1}{p_2}\left(=\frac{MR_1}{MR_2}\right)$.

Similarly, if $\frac{MC_1}{MC_2} < \frac{p_1}{p_2}$, then the production of $Q_1$ would increase and that of $Q_2$ would decrease, resulting in a rise in $\frac{MC_1}{MC_2}$ and this would go on till $\frac{MC_1}{MC_2}$ becomes equal to $\frac{p_1}{p_2}$.

We have obtained, therefore, that the equilibrium commodity combination for our society consisting of two profit-maximising firms and with given quantities ($x^0_1$ and $x^0_2$) of two inputs, is the one where the condition given by equation (21.27) or equation (21.28) is satisfied.

We might remember at this point that the PPC passes through the commodity combinations implicit at the points on Edgeworth contract curve for production (CCP), i.e., these commodity combinations on the CCP have been mapped into the PPC, or, there is a one-to-one correspondence between these commodity combinations implicit at the points on the CCP and those lying on the PPC.